"Can we reverse the machinery which has ground down so much of this country?" The value of protected areas for fauna conservation: Editors' Prologue

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ABSTRACT

The Royal Zoological Society of NSW forum on the value of protected areas for fauna conservation, held in Sydney in November 2014, comprised a series of papers interlaced with a series of plenary discussions, which can be read in full in this theme edition of *Australian Zoologist*. The forum was a parallel event to the IUCN World Parks Congress on protected areas, also held in Sydney in the week following the forum. One outcome of the IUCN Congress was the inspirational statement entitled 'Promise of Sydney', which included a call to invest "in nature's solutions, supported by public policy, incentives, tools and safeguards that help to halt biodiversity loss, mitigate and respond to climate change, reduce the risk and impact of disasters, improve food and water security, and promote human health and dignity". The papers and plenary discussions in this RZS NSW forum all foreshadowed this vision as it applies to protected areas. Our focus in this theme edition of *Australian Zoologist* is on conserving fauna in Australia, and in protected areas in particular. Our concern is not so much whether we are on the right track as a society in establishing and managing protected areas, but that we are going too slowly, much too slowly, if our aim is to ensure the survival of our fauna.

Key words: ecological history; extinction rates; foxes; IUCN; Marine protected areas; National Parks; Nature Reserves; Promise of Sydney; rainforests; State Forests; threatened species; wildlife atlas; World Parks Congress.

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"... a contempt for all values of land except those of the market and of use."

The Australian poet Judith Wright (1980, 29) was forthright with her question: "Can we reverse the machinery which has ground down so much of this country - the machinery of profit-making and of a contempt for all values of land except those of the market and of use?" This succinct question captures the essence of both the Royal Zoological Society of NSW (RZS NSW) forum on the value of protected areas for fauna conservation, held at the Australian Museum on 8 November 2014, and the International Union for Conservation of Nature (IUCN) World Parks Congress on protected areas, also held in Sydney in November 2014. The RZS NSW forum was listed by the Congress as a parallel event.

The scope of the RZS NSW forum was set out in the flyer advertising the day:

> *"A critical, contemporary environmental issue is the relentless loss of our native fauna. This forum will examine the value of protected areas, such as national parks, nature reserves, marine parks, private conservation reserves and multiple-use reserves, for fauna conservation. What makes the subject of protected areas for this year's forum so topical is the fact that the IUCN World Congress on Protected Areas, which is held only every 10 years, is being held in Sydney in 2014, starting only 4 days after this forum. The objective of this forum is to throw a spotlight on the value of protected areas for conserving fauna. Despite their evident benefits, protected areas are criticized for being too small, too many of one type, protected in name only, too few in the fertile lands or wetlands, or only applicable to charismatic megafauna. A crucial element in that debate is the historical context in which protected areas were dedicated; for example, was fauna considered in the process of identifying and protecting areas? This matter of both protected areas and fauna conservation is not just academic, it involves many other interested parties. The word "value" is part of the title, because the concept of setting aside large tracts of land or sea for nature conservation, and adequately managing them, is contested. The subject needs to remain in the public arena, where the case for new and better managed protected areas is won or lost. As in each year's forum, there will be plenary sessions to enable audience participation, which will be recorded and included in the publication to follow."*

The intent of the RZS NSW forum was to expand on the nexus between fauna conservation and the selection and management of protected areas. We were keen to capitalise on the idea that protected areas are global, not just an Australian issue, and provide a critical element in the research, management and conservation of native fauna. We thus paid particular attention to the IUCN postings on this matter both before and after the 2014 IUCN World Parks Congress[1]. 'Protected areas' is a broad term and, as the IUCN program identified, there are many elements to the concept, including the 'value' of parks. The point may sound somewhat cryptic, but the first sentences make the point clear: "The world's ecosystems are succumbing to pressure from human activities: 60% of the planet's ecosystem services have been degraded over the past 50 years. In response, the concept of 'natural capital' has emerged to capture the multiple values of biodiversity and ecosystems for people."

As editors, we had a vision of what was at issue for fauna conservation in relation to protected areas, what a forum might achieve for zoologists, and how to raise the profile of zoology and fauna matters in the discussions on the value of protected areas. The forum comprised a series of papers with a plenary discussion after each bracket of presented papers. Written papers present their case in a systematic fashion so that other scholars, managers and policy writers can see the strengths and limitations in the particular fields addressed. In contrast, the plenary sessions reveal the depth of feeling on the subject, provide insightful anecdotes, and give the audience an opportunity to contribute to the discussion. Indeed, a quarter of the day was given to the plenary debates, which can be read in full in this theme edition of *Australian Zoologist*, and in this prologue we present a glimpse of the cut and thrust of these exchanges. We introduce each paper, pick up some of the plenary comments, and draw our own conclusions on the state of play regarding the value of protected areas for fauna conservation. The presence in Sydney of an international congress on protected areas was a catalyst for the forum, so we now turn to the significance of this congress.

The IUCN World Parks Congress in Sydney, November 2014

The IUCN World Parks Congress, with over 6,000 participants from 160 countries, produced 'The Promise of Sydney Vision'[2]. The first paragraph of the Promise of Sydney contains the statement: "We recognized that rebalancing the relationship between human society and nature is essential, and that ecosystems and their variety of life fully support our existence, cultural and spiritual identity, economies and well-being"[3]. This also portrays the way zoologists understand nature, and see protecting natural areas as a major element in this rebalancing.

Among its introductory statements, this inspirational document celebrated the expansion and improved governance and management of protected and conserved areas around the world, but also cautioned that "threats to nature, its biological diversity and protected areas are now at the highest level in human history, due to a convergence at immense scale of the impacts of human consumption patterns, population growth, and industrial activity." Among the promises were to invest "in nature's solutions, supported by public policy, incentives, tools and safeguards that help to halt biodiversity loss, mitigate and respond to climate change, reduce the risk and impact of disasters, improve food and water security, and promote human health and dignity." These are grand visions and challenges that continue to inspire a wide range of supporters around the world.

Just prior to the IUCN World Congress, *Nature* (vol. 515: 28-31, 6 November 2014) ran a to-do list for the world's parks where experts shared their priorities for what must be done to make protected areas more effective at conserving global biodiversity. Bob Pressey (2014), in an article on maximising returns on conservation, stated that success depends on which natural resources societies are willing to leave unexploited. In his view, the trends are not encouraging. By way of example, Pressey noted that most of Australia's terrestrial and marine parks are residual, and further, that the country's protected area strategy has no quantitative targets for avoiding loss. The Congress could make a real difference, Pressey argued, if it steered policies away from meaningless, counterproductive targets. These are sharp words from someone with a long service to this discipline. We acknowledge this problem as being part of a decline in biodiversity across the board, and detailed examples are provided by the authors in this theme edition of *Australian Zoologist*.

Conserving the marine and terrestrial environments

In an editorial essay foreshadowing the IUCN's Promise of Sydney, Sandwith *et al.* (2014) recognised that protected areas will only continue to work if they are supported by a broad range of people because the pressures ranged against conservation are too great for protected areas to survive in the hands of a few under-resourced enthusiasts.

The struggle to conserve biodiversity values that are increasingly threatened in NSW is shown in the State of the Environment report for NSW (OEH 2015; Lunney 2017a), elsewhere in Australia and America (Bradshaw and Ehrlich 2015), and across the world (Millennium Ecosystem Assessment 2005). Bradshaw and Ehrlich (2015, p167) make the thought-provoking observation that climate disruption is not necessarily the most serious environmental threat. From a small sample they noted that, in 2009, the UK newspapers mentioned biodiversity only 115 times compared to 1382 times for climate change. Until very recently, they noted, there was no biodiversity equivalent to the Intergovernmental Panel on Climate Change. Questions as to whether protected areas are safeguarding biodiversity are answered in different ways by those who look across the contemporary landscape at one point in time and those who see the picture as the evolution and adaptation of an idea (Anson 2017; Hutchings and Kenchington 2017; Lunney 2017b; Lunney *et al.* 2017; Recher 2017; Runge and Tulloch 2017). Both are needed, but not one at the expense of the other. That raises the question of the contribution of the report by Byron *et al.* (2014) and the extent to which it sufficiently explored options to understand and then advocate means to change the way we see and conserve biodiversity in NSW (Lunney *et al.* 2017). It is in that context that we advocate increasing the emphasis on research into why so much of our biodiversity is struggling to survive. Crucially, it is essential to recognise that habitat destruction in the marine environment is just as relevant as in the terrestrial world, as shown clearly by the suite of papers in this forum (Cole *et al.* 2017; Hutchings and Kenchington 2017; Vanderklift 2017; Voyer and Gladstone 2017; Warner 2017).

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[1] http://www.worldparkscongress.org/programme/programme.html

[2] http://www.worldparkscongress.org/about/promise_of_sydney_vision.html

[3] http://www.worldparkscongress.org/about/promise_of_sydney_vision.html

Mat Vanderklift (2017) questioned the concept that marine reserves need to contain representatives of all species if they are to be effective. He argued that this is a fallacy, as many species within a reserve are not threatened by activities elsewhere, which marine reserves can effectively be managed for. Michelle Voyer and Bill Gladstone (2017) provided case studies of why it is so important to consider the social implications of Marine Protected Area (MPA) selection and management. So, while as scientists we can determine the best places to situate MPAs, if they are to be accepted by the community and allowed to function, then it is imperative to build community support. This involves engaging local communities. This view foreshadows the IUCN Promise of Sydney.

The marine presentations moved from State MPAs out into the open ocean, asking how marine biodiversity can be protected in the vast marine areas beyond national jurisdictions. Robin Warner (2017) discussed the scope of the threats to the biodiversity in this zone and how MPAs can be implemented. The paper by Pat Hutchings and Richard Kenchington (2017) argued that historical concepts of terrestrial protected areas have been inappropriately applied to designating MPAs. They explained the three-dimensional nature of marine environments and the widespread movement of species across boundaries, and how most marine species have two life phases. These include pelagic larvae and, often, a sedentary adult stage, which have major implications for the management of MPAs.

In Sydney Harbour, Victoria Cole, Pat Hutchings and Pauline Ross (2017) identified the importance of loss of habitat as a major threat to biodiversity. Increasingly, in coastal environments, we are losing habitats that are crucial in supporting and enhancing local biodiversity. These authors investigated three biogenic habitats found on rocky shores and how the loss of these habitats is leading to the loss of many species. They suggested that any plans for a marine park network in the harbour must take into account these biogenic habitats which support diverse assemblages of invertebrates.

Marine parks have often been managed as if they were terrestrial parks, as they have similar goals, but they present different challenges. There has been a worldwide increase in marine protected areas but, without monitoring and policing, they are effectively "paper parks" and have very limited conservation value. Terrestrial protected areas are designed and managed as a form of land use within the uni-directional flows from hilltop to estuary and arrangements to resolve cross-boundary effects from adjacent properties. Marine protected areas typically address bioregions based largely on seabed habitat. They exist within the 3-dimensional biophysical roles and linkages of the water column. The upper layers of the water column sustain primary production and complex food webs in which larval development stages and distribution of many place-related species interact with permanent water column species. Tides, currents and wind-generated waves provide complex multidirectional linkages across protected area boundaries (Kenchington and Hutchings 2012).

In a terrestrial parallel, Claire Runge and Ayesha Tulloch (2017) examined recent advancements in decision-support tools to incorporate species' movements into systematic conservation planning, and highlighted challenges in traditional approaches for protected area designation for conserving nomadic species They identified that landholders, including graziers and indigenous landholders, will play a key role in safeguarding these species on pastoral lands. They concluded that accounting for the movements of nomadic species and incorporating new approaches to integrated land management will help design conservation solutions that are effective, cost-efficient, and robust to uncertainty in this rapidly changing world.

The recent rezoning of the Great Barrier Reef (GBR) employed the best available data to identify bioregions, each of which characterized particular habitats on the reef and inter-reef areas, and an attempt was made to conserve at least 20% of each of these 76 identified bioregions (Fernandes *et al.* 2010) as no-take areas or green zones. While the boundaries of each of these "no-take areas" were based on biophysical criteria, their finalization through the planning process involved substantial consideration of economic, social and cultural values (Dobbs *et al.* 2011; Kenchington and Day 2011). Such engagement is important for achieving community support for marine protected areas (Voyer and Gladstone 2017). While the rezoning of the GBR has been regarded as good practice (it won a Eureka award), it can be applied elsewhere and should address the challenges of field definition and securing boundaries of marine protected areas that can be regularly monitored and policed.

The plenary sessions at the RZS NSW forum

Some elements of the plenary sessions aimed at providing clarification of various points, but what was needed was a challenge to orthodoxy, to complacency and to poor science. Harry Recher took up that proposition with gusto:

"There is a huge difference between the land environment and the ocean. We need conservation reserves on the land because we destroy the land. We remove all the vegetation. If you want to keep it, you put a fence around it. Until we change our attitude, that's the only way we can proceed, though I'm going to say something quite different in an hour so (Recher 2017). As far as marine protected areas go, I don't see the biological surveys being done that would allow you to sample. I don't see anything being achieved by marine protected areas, despite all the very good evidence from North America showing that they do recover fish stocks."

In his paper, Recher (2017) examined his period on the Scientific Committee of the NSW National Parks and Wildlife Service. Harry is blunt, but we know that weak comments do not change policy or governance attitudes. Also, we do not hear voices raised to dispute Recher's statement: "Australia's system of conservation reserves is inadequate to conserve continental biodiversity". Recher has said loudly what some people are saying quietly, and many more are thinking. The reasons for the inadequacy of the reserve system, Recher points out from long experience in the matter, are historical and embedded in politics, emotion, and ideology. To illustrate these ideas, Recher describes his participation from the late 1960s to the early 1990s, first as a member of the Scientific Committee advising the Minister of Lands and then as a member of the NSW National Parks Advisory Council. He identifies an issue that rarely surfaces, yet deserves a wider debate: that an emphasis on pristine landscapes and wildness compromised recommendations for the development of the New South Wales' reserve system.

Richard Kenchington: "nobody reads scientific papers except scientists"

Short questions can be easy, such as 'what is the value of protected areas for fauna?' In contrast, a short answer is rarely adequate, hence an RZS NSW forum on the subject. Further, exploring the science of the matter is itself not adequate. This is implicit in the broad themes of discussions on protected areas, but it was put frankly in the first plenary session by Richard Kenchington: "I'm just finishing a study with a number of universities and social scientists looking at barriers to the application of science in coastal site management, and there are two or three issues we learned from that. One is that we all know secretly that nobody reads scientific papers except scientists. …That's not communication. There's another thing, that many scientists are anally retentive. They don't like to engage with communities in terms of sharing knowledge, which is a two-way process"

This matter of communication of science remains a theme at every RZS NSW forum, and in this forum it took the following form: "Beth Rohrlach: One of the things I want to raise with all the scientists in this room is a strengthening of community partnership. So if you want political power and political change you need to strengthen the voice of the community in those changes."

Harry Recher responded immediately: "I'm a great supporter of citizen science. I think community groups can contribute significantly. I think there's a problem with the vast majority of scientists not being interested in communicating with people, and I've written about that at length. For the past 20 years, I explain why, because we don't teach English to scientists, so they can't talk, and if you can't talk it's not important, so you avoid doing it."

Another way of addressing the communication issue is with humour. Mike Calver is a master, as is evident in the plenary discussions: "I completely agree that raising community awareness is central. Just picking up on some of the ideas that came through there, on my own campus, Murdoch in Perth, I happened to be walking up a path behind a group of undergraduate students and a small bandicoot came out of the bush, crossed the path, disappeared into the bush on the other side of the path. The students were stunned. 'Gee, what was that?' 'Don't know. Sort of a long-nosed rabbit, wasn't it?' And the comment there about the general ignorance of flora and fauna, I think is very important and does need to be addressed through community education."

That may sound easy but as Mike Calver and Grant Wardell-Johnson (2017) in their paper demonstrate, it is a long, hard row to hoe. Their Western Australia case study focused on the changes in forested bioregions of south-western Australia since 1826. The conservation reserves in the region were originally chosen on aesthetic appeal, but they mostly align poorly to modern CAR (comprehensive, adequate and representative) criteria. They make a powerful case that much may be gained by taking an historical perspective and grounding contemporary policy in an understanding of the successes and failures of the past.

Recognising and resolving local priorities

Consider this comment by Pat Hutchings in the plenary sessions: "I'd like to follow up on a point that Harry Recher made. He was saying that a large percentage of the fauna out there is not described, and yet every single museum in Australia is suffering financially. We are losing the people that can go out there and actually describe the fauna. So it's a very sad case, and we are presenting a paper in two weeks' time in Canberra where we're looking at the future of marine science research (Hutchings 2014). I don't think anyone's going to listen, but we're at least going to tell them that we need to have some more taxonomists to understand what biodiversity is out there, let alone learn how to manage it." The point here is that it is one thing to have a grand and sweeping vision, but the value of protected areas to fauna depends on knowing the fauna, hence the vital role of museums and their resident taxonomists.

The question of why focus on mammals is a recurrent theme in scientific discussions. It emerged in the plenary sessions, as follows: Mat Vanderklift: "I've been waiting to see if I was going to get clear articulation from speakers about what the objectives were. I got one today. I got one this afternoon from Jen's [Anson] talk. Thanks very much for that, Jenny [see Anson 2017]. It was a good, clear objective that you gave at the beginning of your talk on what AWC [Australian Wildlife Conservancy] is about, the conservation of species and going on to describe what AWC is doing for mammals. So what's AWC doing for the other faunal objectives? Jennifer Anson: "I tend to focus on mammals because that's where my interest is, and I think AWC has some focus on mammals because we're funded by donations, and people like mammals. But there are also huge numbers of other species in the sanctuaries, high reptile diversity, for example, and all of these are both conserved and studied. So it's not just the mammals. It's just that's what I was presenting today."

In her paper, Anson (2017) looked at predator-proofing for conservation, and presented the AWC perspective. Invasive predators, Jen outlined, namely the European red fox *Vulpes vulpes* and the feral cat *Felis catus*, are lethal to small and medium-sized mammals. Their suppression is critical, but few broad-scale programs are effective. One of the most successful approaches is the establishment of predator-exclusion areas; offshore islands or mainland 'islands' protected by predator-proof fencing.

The following exchange in the plenary session touched a number of novel approaches to the fate of the mammals of the arid lands. Debbie Andrew asked Chris Dickman whether he thought that it was feasible to control foxes and cats in his arid landscape research site in Queensland without impacting on dingoes? The reply reveals the issues and the caveats to a simple solution: "I think it's probably possible to manage the impacts of foxes without the presence of dingoes. I don't see anything we can do about cats. I don't think there's anything really on the horizon that will allow us to control cats and their impacts on a broad scale. There are certainly some possibilities on the horizon. There are the cat baits, Curiosity cat baits. There are the Assassin traps. There are all sorts of things that are being trialled. I think broad scale the only thing we've got in our favour is dingoes as a biodiversity regulator. If there are ways of working through the problems of having dingoes in the landscape, for example we could use guardian dogs on properties, then I think we probably can have our cake and eat it too. Some hazards that I was talking about of the influx of predators, foxes and cats, into these environments after boom times wouldn't be anywhere near as hazardous or as damaging if dingoes were there to reduce their impacts."

Since two of the three editors of this theme edition are mammalogists in their principal research focus, both Jen Anson's and Chris Dickman's replies make sense. But Mat's point remains, the fish in marine environments matter and, as Pat Hutchings points out, so too do marine invertebrates which are at the base of the food chain and thus critical to marine ecosystems. The paper by Cole *et al.* (2017) for Sydney Harbour is a vivid statement of the importance of marine invertebrates to conserving the biodiversity of the harbour.

These issues of both invertebrates and of scale emerged in a clear exchange in the plenary sessions, and while there is a world vision, there is also an essential need for a local and detailed focus. Consider the following exchange: Jackie Coughlan: "As a consultant, we are often asked to look at the potential impacts of a development on flora and fauna of some quite scrappy, small pieces of vegetation and fauna habitat, whether these be rail-side or roadside patches, whatever. I personally think they're all important, or may well all be important, but if they don't have threatened species in them and they're quite small and there's something bigger nearby, that's the end of it…is it really just a waste of time and money to bother trying to argue to protect the small, urban stuff that doesn't support threatened species?"

Dieter Hochuli replied: "I think that's a really important question. It raises the issue of habitat damage generally. The ultimate concern here is if you have a black and white case: does it contain, or not contain, threatened species? But there's a case for thinking about another context: that there's a value for some of that vegetation outside the legislative perspective, for example social or cultural...". Zoologically, both Coughlan and Hochuli are spot on. Small patches matter, invertebrates matter, and urban wildlife matters. This idea alone could be the basis of another forum.

State-based management of protected areas and fauna conservation

In his paper on "The World Heritage List and New South Wales Rainforest- reflections on the events of 30 years ago", Paul Adam (2017) opened with the statement that in the decade from the early 1970s to the early 1980s the most high profile environmental/conservation issue in New South Wales was the management of forests, and, in particular, rainforests. Adam's closing reflection was that the then NSW premier, Neville Wran, testified: "when we are all dead and buried and our children's children are reflecting on what was the best thing the Labor government did in the 20th century, they will come up with the answer that we saved the rainforests." These comments reflect the politics, the media involvement, the strength of the conservation movement and the rapidly growing recognition of the importance of creating National Parks to conserve our natural heritage. While the detail is fascinating, what is also striking is the need to record these events both ecologically and historically. Adam's paper is an exemplar of how to go about this exercise.

Slade and Law (2017) point to the value of informal reserves for conservation within the State Forest estate in NSW. They identify State Forest conservation areas as including formal Flora Reserves and a suite of informal reserves including riparian protections, ridge and headwater connections, old growth patches, rare and non-commercial forest types, rainforest, heath, rock outcrops, steep slopes, wildlife corridors, large forest owl protection areas and species-specific exclusion zones. Importantly, they point out, these informal reserves receive legal protection via the State Forest Management Zones (FMZ) across the landscape. There is a number of messages in their paper: informal reserves within commercial State Forests contribute to conservation of the fauna; there is a need to monitor, and to shift the focus from mandatory pre-logging survey to monitoring, and to conduct research within this framework. We are indebted to such skilled local knowledge, the willingness to work in a commercial context, and the grasp of the need to monitor and research far more than is undertaken. This is not heretical thinking, it should be standard practice if our view of forests is one of ecological sustainability, meaning all the values of a forest. The fauna is seen by many as a primary value of a native forest, and Slade and Law have pointed to a re-arrangement of policy to counter the relentless pressure to cede State Forests to become National Parks. As Roux *et al.* (2015) conclude, "Amid increasingly challenging realities for conservation of ecosystems, agency science functions are vital to providing the evidence base required for effective management and policy development."

When we look back at the many decades in which State agencies have been dedicating parks and reserves, and managing wildlife, there is a dearth of publications covering these topics. Whether you are an historian or a conservation biologist, you will be dismayed at how little documentation exists on how and why decisions were taken, or not taken. The public record would ideally be flush with papers describing what was occurring, why and what were the successes or otherwise of various actions, and how management changed in response to that learning. The ideas, the datasets and the plans have often faded from view before any final decisions as to value have been made, or often not made at all. The written record is then invaluable, but far too often missing, either not made or lost. Hence the importance of capturing the ideas present at the time of the decisions, as shown in many papers in this forum (Adam 2017; Calver and Johnson 2017; Lunney 2017b; Lunney *et al.* 2017; Recher 2017).

By way of contrast to a State-based approach, publications from academic institutions often take a national or international view, even though it is primarily the State agencies in Australia that have the responsibility for selecting and managing protected areas and conserving and managing the wildlife. The focus on the national picture makes ecological sense, such as in the papers by Anson (2017), Runge and Tulloch (2017), Vanderklift (2017) and Warner (2017), but it does not necessarily deliver as much administrative clout as a State-focused study. Many papers in this RZS NSW forum are cases in point. Each paper is familiar with their State's legislation, administrative procedures for such matters as scientific licences for studying wildlife, how and when the various databases were set up, and their limitations as well as their strengths (*e.g.* Cole *et al.* 2017; Adam 2017; Lunney 2017b; Lunney *et al.* 2017; Slade and Law 2017; Recher 2017). By taking a national view, there is an assumption that Commonwealth legislation, particularly the *Environment Protection and Biodiversity Conservation Act 1999*, along with the Commonwealth databases, provide an adequate database for analyses, and that any conclusions from a paper will be taken up by the Commonwealth. This a potential trap. It is not a question of the science, rather it is how such conclusions can be applied within a State agency. Given these qualifications, it is nonetheless engrossing to read the intellectual reach and the insights from academic institutions that are not hemmed in by a day-to-day workload of some state agency program, or its fears or local preferences. We now examine just a few of these ideas as they bear on this subject of selecting and managing protected areas and conserving wildlife across the world.

Wilson *et al.* (2011) applied a high level of mathematical skill to their project of prioritizing conservation investments for mammal species globally. They arrived at the striking conclusion that the establishment of new protected areas was the action receiving the greatest investment, while restoration was never chosen. In posing the question, "Do protected areas safeguard biodiversity?" Baillie *et al.* (2016) concluded that it is clear that even if we meet Aichi target 11 by 2020[4], it would be insufficient to ensure viable populations of species currently known to be threatened[5]. They concluded their introductory remarks by pointing out that much better reporting on the effectiveness of the world's protected areas is needed from the site to the national to the international scale.

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[4] Target 11: By 2020, at least 17 per cent of terrestrial and inland water areas and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascape. https://www.cbd.int/sp/targets/rationale/target-11/

[5] This view appears in the first chapter of the globally-oriented book by Joppa *et al.* (2016), and such books are most welcome in pulling

In contrast, failure is possible as pinpointed in a sharp letter to the editor of *Science* by Lindenmayer and Possingham (2013). They stated that, to the best of their knowledge, and despite state and national threatened species legislation, this was the first time an Australian government has taken calculated actions to substantially reduce the viability of an IUCN-listed endangered species with full knowledge of the likely consequences. They are referring to a system of protected areas that was established in 2008 for Leadbeater's possum *Gymnobelideus leadbeateri,* a species which has been the subject of more than 30 years of research. As they pointed out, to counter biodiversity loss, the most widely used strategy is to establish reserves. Yet in the two years prior to their article, they stated that government-sanctioned changes in legislation and a substantial watering down of protocols for habitat protection had resulted in clearfell logging of those reserves. They say there is no excuse for government-sanctioned legal logging of the reserve system. In fact, the subject of threats to the system of protected areas is all too real (e.g. Craigie *et al.* 2015), now with its own special term PADDD (protected area downgrading, downsizing and degazettement).

One aim of this RZS NSW forum was to increase the profile of the even more pressing need for scientists to be on staff and working in protected areas. In historical perspective, protected areas were, and often still are, under-estimated both for wildlife research and as havens for fauna populations, as is the value of protected areas for research and for conserving biodiversity in NSW (Lunney *et al.* 2017). This historical account puts the role of fauna research and conservation in protected areas as a relatively recent event, well within a working lifetime. It strengthens Harry Recher's (2017) case that politics, emotion and ideology were powerful forces a half century ago, and it helps explain why Slade and Law (2017) are still pushing for an upgrade in research and conservation of reserves in State Forests, as well as why Pat Hutchings and her marine colleagues need to work so hard, their case does seem out of sight, out of mind, a point the RZS has explored before (Hutchings and Lunney 2003).

Conclusion: the value of protected areas for fauna

Laurance (2015), in a brief letter, makes the convincing point that scientists are often staunch defenders of parks politically, encouraging journalists to visit and write about the parks, and lobbying both locally and internationally – often with great effectiveness – for their protection, and yes, Laurance adds, parks offer many research opportunities for scientists. But, he concludes, scientists also offer many potential protective benefits for parks. For us, such strong writing is much needed, including with agencies where research is sometimes seen as an impost on park managers, especially if the research is searching for global patterns, even blue sky research, rather than a local focus of helping park managers. Every paper in this RZS NSW forum provides detailed Australian examples of Laurance's letter, which was aimed at an international readership, but is just as relevant to each Australian State.

One of the benefits of a forum is that it allows people to formulate or crystallise a thought that might not emerge while sitting in front of your computer. Chris Dickman articulated a conclusion from this forum while standing on his feet addressing the audience in a plenary session: "One of the things that came through to me was that we're not dealing with fixed boundaries, with lines on maps. Fauna can and do move into and out of protected areas. Even if you have fauna within a protected area there are threats from outside that can come in and affect them. Some of the protected areas are also very small. A number of people touched on all of those points, but also said that there is a very important human dimension, and this comes in a number of forms. One is that just being close to nature, no matter if it's a small handkerchief park as Tanya Leary talked about, or one of the other small areas, can be very important from the point of view of human wellbeing. Another that came through is that, from the point of view of getting people used to the fact that we do have an endemic biota, a really fascinating endemic native fauna and flora, it might help to engender more of a 'sense of place' that a number of people touched on, though not using those words, and that might be another value of trying to protect fauna in areas of different size. Is that a topic that we could perhaps think a little bit more about as a theme in a number of talks? Would anybody like to comment on that? The human dimension: what do we do to improve people's understanding, awareness and appreciation for fauna in protected areas?"

An intriguing aspect of protected areas is their diversity on a global scale, but our focus here has been Australia. Nevertheless, there are sharp contrasts, from the arid lands where Chris Dickman has spent the last quarter of a century, to the Great Barrier Reef where Pat Hutchings feels at home. They are all part of this one discussion. Bill Gladstone also captured this point in his closing comment in the plenary on marine reserves: "One of the things that emerged from our study of people's perceptions about marine parks was that there was a general acceptance that conservation zones, or no-take sanctuary zones, were important and relevant for providing reference areas for science and education where we can understand what goes on in undisturbed systems to improve our ecological understanding and to monitor what goes on in nearby used areas and to protect areas that may be important for threatened species." Intellectually, ecologically and socially, from the centre of Australia to the blue waters beyond our shore, there are far more common threads than

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together a raft of essays that collate many ideas to present a current state of play in this critical field.

there are differences. Zoologically there are spectacular differences, and while we might spend almost all our effort in one ecosystem, it is essential to step back, as we have done in this forum, to appreciate the common ideas as well as obvious differences.

We can say as editors that everyone in the room had a potential comment, some are presented as papers published in this theme edition, others as published in the plenary sessions, and others emerged from their energy and contribution to promoting the value of protected areas for fauna in their work or as volunteers. The IUCN World Parks Congress that followed the RZS NSW forum is a striking example of the global interest in protected areas. Our focus in this theme edition of *Australian Zoologist* is on conserving fauna in Australia, and in protected areas in particular.

We now venture to offer a reply to Judith Wright's candid question: "Can we reverse the machinery which has ground down so much of this country - the machinery of profit-making and of a contempt for all values of land except those of the market and of use?" We can predict that as more and more of our cities, towns and countryside become ever-more crowded with people, conserving our fauna will become increasingly important and the contribution of protected areas to this endeavour will also be progressively more recognised as imperative. Our concern is not so much whether we are on the right track as a society in establishing and managing protected areas, but that we are going too slowly, much too slowly, if our aim is to ensure the survival of our fauna.

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